Remarks

Claims 1-17 are pending in this application. Claims 1-17 are under final rejection as being unpatentable over Coash (U.S. Patent No. 4,684,853) in view of Anderson (U.S. Patent No. 5,367,537). Applicants believe that the invention is patentable, and that claims 1-17 are in condition for allowance.

The invention relates to a transmitter circuit and to transmitting utilizing a surface acoustic wave (SAW) resonator as a frequency control element in an oscillator.

In an existing SAW stabilized transmitter, a data signal is used to turn the SAW stabilized oscillator on and off to create a sequence of radio frequency bursts. The sequence of radio frequency bursts passes through an amplifier and is transmitted with an antenna. The SAW stabilized oscillator of the SAW stabilized transmitter takes a certain amount of time to turn on. As such, the maximum data rate for the data signal is dependent on the amount of time that it takes to turn on the SAW stabilized oscillator because the oscillator is turned on and off to create the sequence of radio frequency bursts.

The invention provides an improved transmitter circuit of the type including a SAW stabilized oscillator circuit. According to the invention, the amplifier circuit receives the carrier signal and the data signal. The amplifier circuit generates an output signal as the carrier signal modulated with the data signal. The approach of the invention overcomes a limitation associated with the existing on-off keyed SAW stabilized transmitter in that, in the approach of the invention, the maximum data rate for the data signal is no longer strictly dependent on the amount of time that it takes to turn on the SAW stabilized oscillator. This is because the amplifier circuit, according to the approach of the invention, receives the carrier signal and receives the data signal, and the amplifier circuit generates an output signal as the carrier signal modulated with the data signal. In this way, it is possible for the oscillator circuit to run continuously, producing the carrier signal, while the data signal modulates the carrier signal at the amplifier circuit by shifting the output signal power.

Claim 1 defines the invention as a transmitter circuit comprising an oscillator circuit and an amplifier circuit. The oscillator circuit includes a surface acoustic wave (SAW) resonator. The oscillator circuit generates a carrier signal. The amplifier circuit receives the carrier signal and receives a data signal. The amplifier circuit generates an output signal as the carrier signal modulated with the data signal.

It is important to note that, in accordance with the claimed invention, the amplifier circuit receives the carrier signal and receives the data signal, and the amplifier circuit generates the output signal as the carrier signal modulated with the data signal. This specifically recited feature is not described or suggested in the references applied by the Examiner.

The approach of the invention is exemplified by the illustrated embodiment in Figures 1 and 2. As shown in Figure 1, the carrier signal at 26 is received by amplifier circuit 14, which also receives a data signal through input resistor 30. As shown in Figure 2, at the circuit level, carrier signal oscillator circuit 62 is coupled with capacitor C3 such that the carrier signal is modulated with the data signal at the input of amplifier circuit 64. Preferably, on/off keying is performed, but other modulation techniques may also be used.

In contrast to the invention, Coash describes a different type of transmitter with a SAW oscillator. As described by Coash and as exemplified in Figure 1, a modulation sub-circuit of the oscillator circuit includes a voltage variable capacitor 22. Voltage variable capacitor 22 responds to input voltage variations to modulate the capacitance of the feedback circuit, thereby modulating the frequency of the transmitter. The Examiner has acknowledged on the record that Coash does not specifically teach an amplifier circuit receiving the carrier signal and receiving a data signal, with the amplifier circuit generating an output signal.

In making the rejection, the Examiner relies on Anderson as a secondary reference. However, Anderson, also in contrast to the invention, describes another different type of transmitter with a SAW-based modulating circuit. Anderson describes a SAW-based

frequency shift keying modulating circuit. As exemplified in Figure 2 and as described by Anderson, a frequency shift keying modulating circuit produces a first frequency according to a SAW transducer natural resonant frequency and a second frequency according to the SAW in combination with a reactive element (26, or 25 and 26'). The frequency selected is determined by the state of a PIN switching diode (27') in parallel with the reactive element. That is, Anderson describes the selective bypassing of the reactive element to effectively change the resonating frequency.

More specifically in Anderson, a frequency shift keying modulating circuit including the SAW resonator produces either a first frequency or a second frequency depending on the state of the bypass, and the produced signal is amplified and transmitted. It is critical to note that Anderson manipulates the resonating circuit to perform modulation. This reactance/bypass type approach is far different than an approach, such as recited in claim 1, in which an amplifier circuit receives the carrier signal and receives the data signal, with the amplifier circuit generating an output signal as the carrier signal modulated with the data signal.

Anderson selectively manipulates the frequency of a signal that is then applied to the base of transistor 17. Accordingly, both of the applied references are deficient. Neither reference suggests the claimed feature of the amplifier circuit receiving the carrier and data signals and generating the output signal, and there is no motivation to combine these references to achieve the claimed invention.

The Examiner makes specific reference to Figure 1 of Anderson. Note that in Figure 1 of Anderson, the amplifier circuit does not receive the carrier signal and data signal and generate an output signal as the carrier signal modulated with the data signal, as recited by claim 1. In contrast, the amplifier 10 receives a signal having one of two frequencies depending on the state of bypass 27. Thus, Anderson is deficient in its teachings. Applicants' invention is able to avoid manipulating the oscillator during operation as is done in existing approaches including the frequency shift keying approaches of both Coash and Anderson.

In the final Action, the Examiner has maintained the previous rejection and states that "The amplifier therefore will receive both said digital information signal and said carrier signal, thus enabling said combination to be transmitted." Applicants disagree with this statement by the Examiner. The amplifier in Anderson will not receive both the digital data signal and the carrier signal and provide the modulated output signal as recited by claim 1.

Applicants direct the Examiner's attention to Anderson, Figure 2 and column 3, lines 18-41. Capacitor 24 and capacitor 25 provide DC blocking and have no consequential effect upon the oscillatory loop (see lines 29-31; also see lines 36-38). In this way, Anderson uses PIN diode 27' to selectively bypass inductor 26' to effectively change the resonating frequency. Note that capacitors 24 and 25 essentially block the data signal from reaching the output amplifier stage at transistor 17. Thus, Anderson is deficient, and Coash in view of Anderson fails to suggest the claimed invention.

Each independent claim, namely, claims 1, 9 and 17, specifically recites in combination, the concept of the amplifier circuit receiving the carrier signal and receiving the data signal with the amplifier circuit generating an output signal as the carrier signal modulated with the data signal. This concept in the claimed combination is not suggested by either reference applied by the Examiner or by the combination of these two references. Again, the Examiner acknowledges that Coash lacks this particular claimed feature. And with regard to Anderson, Applicants have explained above that the data stream in Anderson is used specifically to selectively bypass a reactive element to effectively change the resonating frequency and is blocked by capacitors 24 and 25, which is far different than the approach of the claimed invention.

The remaining claims are dependent claims and are also believed to be patentable at least for the reasons given with respect to the base claims.

Respectfully submitted,

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